

**Remarks:**

These remarks are responsive to the Office action dated March 23, 2007. Prior to entry of this response, claims 1-4, 7-11, 14-22, 24, 25, 29-31, 33-35 and 51-59 were pending in the application. By way of this response, claims 16, 17, 29, and 52-55 are amended, claims 1-4, 7-11, 14-15, 19-22, 24, 25, and 51 are cancelled, and claims 60-64 are added. Applicants respectfully request reconsideration of the application and allowance of the pending claims.

**Rejections under 35 U.S.C. § 102**

Claims 1, 3, 7-9, 14-20, 24, 25, and 51-59 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent Number 6,382,193 (Boyer).

**Rejections under 35 U.S.C. § 103**

Claims 2, 3, 10, 11, and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boyer.

Claims 29-31 and 33-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boyer in view of U.S. Patent Number 6,401,684 (Hori).

**Discussion**

Applicants thank the Examiner for carefully considering the subject application. Before discussing the above issues in detail, Applicants submit that some background information may be useful.

As described in Applicants' specification, the inventors herein have recognized that various advantages in operation may be achieved by appropriate selection of a number of cylinders carrying out combustion, and within those active cylinders, a number and physical configuration (or pattern) of active valves.

For example, it may be possible to better control specific valve conditions, such as temperature. In one example embodiment, when an engine is operating with deactivated cylinders, the gas temperature in the active cylinders may increase due to the higher cylinder air charge, heating the surrounding cylinder

and valves. However, an engine can tolerate higher cylinder gas temperatures if, in one example, exhaust valves are operated in alternate cylinder cycles. I.e., if in a single cylinder, one exhaust valve operates during one cycle of the engine and then a different exhaust valve operates during a subsequent cycle of the engine, the temperature of active exhaust valves can be reduced. Specifically, during the exhaust stroke, hot exhaust gases pass over an open exhaust valve into the manifold and increase heat added to the valve. However, if multiple exhaust valves in a single cylinder are controlled to operate alternately, the inactive valve maintains contact with the cylinder head allowing it to cool.

Note that the above example is merely one example embodiment, but it nevertheless illustrates the advantageous operation recognized by the inventors herein that may be achieved by operation according to new claim 60, which claims:

A method for operating an internal combustion engine with electrically actuated exhaust valves communicating with an exhaust system via an exhaust manifold, the method comprising:

operating the engine in a first mode with a first number and pattern of active exhaust valves per cylinder operating to carry out combustion in active cylinders; and

operating the engine in a second mode with a number of cylinders deactivated, and a second number and pattern of active exhaust valves per cylinder operating to carry out combustion in active cylinders, where said first number or pattern of valves operating is different from said second number or pattern of valves operating.

Turning now to the cited art, Applicants can find nothing in either Boyer et al. or Hori et al. that shows adjusting a number or pattern of exhaust valves per cylinder as recited in claim 60.

Continuing with the pending claims, Applicants likewise fail to find all claimed elements of claim 52. For example, with regard to Claim 52, it claims:

A method for operating an internal combustion engine with electrically actuated valves, the method comprising:

operating the engine in a first mode with a first number of cylinders deactivated, and a first number of valves operating to carry out combustion in active cylinders; and

operating the engine in a second mode with a second number of cylinders deactivated, and a second number of valves operating to carry out combustion in active cylinders, where said first number of cylinders deactivated is different from said second number of cylinders deactivated, and said first number of valves operating is different from said second number of valves operating, and where said first number of cylinders is less than said second number of cylinders, and said first number of valves is greater than said second number of valves.

As shown in Fig. 11, various example modes are illustrated as being selectively used to provide advantageous operation. Two example modes shown are:

- 1) V4 mode (with 4 deactivated cylinders) operating with two active valves (e.g., alternating intake and alternating exhaust valves, AIAE); and
- 2) V2 mode (with 6 deactivated cylinders) operating with four active valves (e.g., dual intake and dual exhaust valves, DIDE);

Comparing to the cited disclosure of Boyer et al., it shows operation that is precisely the opposite of claim 52. Specifically, as shown by a portion of Fig. 4 reproduced below, when operating with less deactivated cylinders (but still some cylinders deactivated), Boyer et al. uses the same or less active valves. For example, when the "boosted VDE" mode has less cylinder deactivated than the "VDE" mode, it has the intermediate valve closed, thus either using the same number or less valves as the "VDE" mode. Similar arguments apply to claim 16. As such, the pending rejection of claims 16 and 52 should be withdrawn.

OPERATING MODE	# OF FIRING CYLINDERS	# OF INACTIVE CYLINDERS	BOOST	INTERMEDIATE VALVE
FULL CYLINDER	8	0	NATURALLY ASPIRATED	OPEN
BOOSTED VDE	4	1-4 FOR VARIABLE BOOSTING	VARIABLE	CLOSED
VDE	4	4	NATURALLY ASPIRATED	OPEN OR CLOSED

Likewise, claim 53 also includes operation that is opposite to the teachings of Boyer et al. Specifically, claim 53 claims

A method for operating an internal combustion engine with electrically actuated valves, the method comprising:

operating the engine in a first mode with a first number of valves per cylinder operating to carry out combustion in all cylinders of the engine; and

operating the engine in a second mode with a number of cylinders deactivated, and a second number of valves per cylinder operating to carry out combustion in active cylinders, where said first number of valves operating is less than said second number of valves operating.

Referring again to the table of Boyer et al. reproduced above, Boyer's all cylinder operation ("Full cylinder") uses the same or more valves than any of the cylinder deactivation ("VDE" or "boosted VDE") modes, not less as in claim 53.

Continuing, claim 55 specifies an intake manifold configuration that is completely different from that of Boyer et al., and which would completely destroy the functionality that is the basis of Boyer et al. Specifically, claim 55 claims:

A method for operating an internal combustion engine with electrically actuated intake valves, the method comprising:

operating the engine in a first mode with a first number of cylinders deactivated, and a first configuration of electrically actuated intake valves operating to carry out combustion in active cylinders; and

operating the engine in a second mode with a second number of cylinders deactivated, and a second configuration of electrically actuated intake valves operating to carry out combustion in active cylinders, and said first configuration of valves operating is different from said second configuration of valves operating, where each electrically actuated intake valve in the first and second valve configurations communicates between cylinders and a common intake manifold.

Boyer et al., on the other hand, relies on a separated boost manifold 16 and intake manifold 14 to enable the boosted VDE mode, which function would be destroyed by a common intake manifold for both valves 18 and 20.

Finally, with regard to claim 29, Applicants submit that even if the cited references are combined, there is no disclosure of "determining a number of electrically actuated valves to operate in said selected cylinder based on said number of cylinders and based on said electrically actuated valve operating condition." As described in Applicants specification, it can be advantageous to determine a number of valve to operate in selected cylinders based on both the

number of active cylinders, as well as, a condition of a valve. For example, as noted above, when operating some cylinders deactivated, it may be advantageous to select a lower number of active exhaust valves based on temperature of a valve to avoid valve degradation. No such concepts are even intimated by Boyer et al. As such, the rejection of claim 29 should be withdrawn.

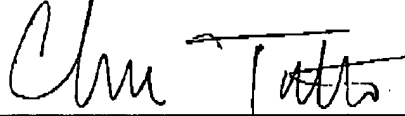
#### Conclusion

Applicants believe that this application is now in condition for allowance, in view of the above amendments and remarks. Accordingly, Applicants respectfully request that the Examiner issue a Notice of Allowability covering the pending claims. If the Examiner has any questions, or if a telephone interview would in any way advance prosecution of the application, please contact the undersigned attorney of record.

Please charge any cost incurred in the filing of this Response, along with any other costs, to Deposit Account No. 06-1510.

Respectfully submitted,

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